Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Advanced particle-in-cell simulation techniques for modeling the Lockheed Martin Compact Fusion Reactor[1] DALE WELCH, Voss Scientific, GABRIEL FONT, Lockheed Martin, ROBERT MITCHELL, DAVID ROSE, Voss Scientific — We report on particle-in-cell developments of the study of the Compact Fusion Reactor. Millisecond, two and three-dimensional simulations (cubic meter volume) of confinement and neutral beam heating of the magnetic confinement device requires accurate representation of the complex orbits, near perfect energy conservation, and significant computational power. In order to determine initial plasma fill and neutral beam heating, these simulations include ionization, elastic and charge exchange hydrogen reactions. To this end, we are pursuing fast electromagnetic kinetic modeling algorithms including a two implicit techniques and a hybrid quasi-neutral algorithm with kinetic ions. The kinetic modeling includes use of the Poisson-corrected direct implicit,[1] magnetic implicit,[2] as well as second-order cloud-in-cell techniques. The hybrid algorithm, ignoring electron inertial effects, is two orders of magnitude faster than kinetic but not as accurate with respect to confinement. The advantages and disadvantages of these techniques will be presented. [1] D. R. Welch, D. V. Rose, B. V. Oliver, and R. E. Clark, Nucl. Inst. Meth. Phys. Res. A 464, 134 (2001). [2] T. C. Genoni, R. E. Clark and D. R. Welch, The Open Plasma Physics Journal 3, 36 (2010).

[1]Funded by Lockheed Martin.

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Date submitted: 14 Jul 2017 Electronic form version 1.4